CLAIMS

1. A method for shaping transmitted power spectral density based on line condition data, the method comprising the steps of:

determining first line condition data associated with a first modem;

determining second line condition data associated with a second modem;

exchanging, respectively, the first and second line condition data between the first modem and the second modem; and

shaping a transmit spectrum for each of the first modem and the second modem in response thereto.

2. The method of claim 1, wherein the transmit spectrum of the first modem and the transmit spectrum of the second modem are shaped differently.

3. The method of claim 1, wherein the transmit spectrum of the first modem and the transmit spectrum of the second modem are shaped substantially the same.

4. The method of claim 1, further comprising the step of:

identifying one or more interfering signals that interfere with data received by each of the first modem and the second modem where the interfering signals comprises one or more of noise and echo.

5. The method of claim 1, wherein the steps are performed prior to a step of modem training.

6. The method of claim 1, wherein the steps of determining line condition data further comprise the steps of:

determining a plurality of signal power values associated with at least one of the first modem and the second modem;

determining a plurality of noise power values associated with at least one of the local modem and the remote modem; and

determining a plurality of signal to noise ratio values associated with at least one of the local modem and the remote modem.

7. The method of claim 1 wherein line condition data comprises noise data and loop data; wherein noise data occupy a range of values between high noise and low noise and wherein loop data occupy a range of values between short loop and long loop.

8. The method of claim 7, further comprising the step of:

reducing transmitted power for a predetermined plurality of frequencies for reducing uncancelled echo power at a first modem wherein the first modem is a local modem.

9. The method of claim 8, wherein a maximum loop length is extended for which a signal to noise ratio is maintained above a minimum signal to noise ratio.

10. The method of claim 8, wherein a noise margin is increased on a loop for which the uncancelled echo power reduces the noise margin, wherein the noise margin comprises an amount of noise that is added after at least one of a first modem and a second modem achieves steady-state while maintaining a signal to noise ratio above a minimum signal to noise ratio.

11. The method of claim 8, wherein the uncancelled echo power is reduced because of a reduction in one or more effects of a nonlinear echo channel producing noise at frequencies other than a transmitted frequency.

12. The method of claim 8, wherein the uncancelled echo power is reduced because of a reduction in a required number of echo canceller filter taps.

13. The method of claim 1, further comprising the step of:

increasing transmitted power for a predetermined plurality of frequencies for increasing a signal received at the second modem, the second modem being a remote modem, wherein the received signal at the remote modem is determined by the signal transmitted by the first modem, the first modem being a local modem, and loop attenuation.

14. The method of claim 1, further comprising the step of:

minimizing a number of transmit filters to be stored by using at least one transmit filter with a plurality of normalized parameters that are normalized to a data rate.

15. The method of claim 14, wherein the normalized parameters comprise a cutoff frequency of the transmit filter.

16. The method of claim 1, further comprising the steps of:

implementing a first power spectral density for optimizing noise performance; and

implementing a second power spectral density for optimizing reach performance.

17. The method of claim 14, further comprising the step of:

interpolating between the first power spectral density and the second power spectral density.

18. The method of claim 1, wherein the first line condition data and the second line condition data are from a common line.

19. The method of claim 1, wherein the first line condition data and the second line condition data are from different lines.

20. The method of claim 1, wherein one or more of the first line condition data and the second line condition data are derived from cross talk.

21. The method of claim 1, wherein one or more of the first line condition data and the second line condition data comprise a frequency-independent reduction in power determined by calculating a signal to noise ratio using a geometric mean for a sub-band of a total frequency band for a plurality of rates.

22. The method of claim 11, further comprising the step of:

choosing a transmitted power for a predetermined plurality of frequencies to simultaneously balance reducing the uncancelled echo power at the local modem while increasing a received signal at the second modem, the second modem being a remote modem.

23. The method of claim 14, further comprising the step of:

choosing a transmitted power for a predetermined plurality of frequencies to simultaneously balance reducing uncancelled echo power at the first modem, the first modem being a local modem, while increasing a received signal at the second modem, the second modem being a remote modem.

24. A system for shaping transmitted power spectral density based on line condition data, the system comprising:

a first determining module for determining first line condition data associated with a first modem;

a second determining module for determining second line condition data associated with a second modem;

an exchanging module for exchanging, respectively, the first and second line condition data between the first modem and the second modem; and

a shaping module for shaping a transmit spectrum for each of the first modem and the second modem in response thereto.

25. The system of claim 24, wherein the transmit spectrum of the first modem and the transmit spectrum of the second modem are shaped differently.

26. The system of claim 24, wherein the transmit spectrum of the first modem and the transmit spectrum of the second modem are shaped substantially the same.

27. The system of claim 24, wherein further comprising:

an identifying module for identifying one or more interfering signals that interfere with data received by each of the first modem and the second modem where the interfering signals comprises one or more of noise and echo.

28. The system of claim 24, wherein the system is operated prior to modem training.

29. The system of claim 24, further comprising:

a signal power determining module for determining a plurality of signal power values associated with at least one of the first modem and the second modem;

a noise power determining module for determining a plurality of noise power values associated with at least one of the local modem and the remote modem; and

a signal to noise ratio determining module for determining a plurality of signal to noise ratio values associated with at least one of the local modem and the remote modem.

30. The system of claim 24 wherein line condition data comprises noise data and loop data; wherein noise data occupy a range of values between high noise and low noise and wherein loop data occupy a range of values between short loop and long loop.

31. The system of claim 30, further comprising:

a reducing power module for reducing transmitted power for a predetermined plurality of frequencies for reducing uncancelled echo power at a first modem wherein the first modem is a local modem.

32. The system of claim 31, wherein a maximum loop length is extended for which a signal to noise ratio is maintained above a minimum signal to noise ratio.

33. The system of claim 31, wherein a noise margin is increased on a loop for which the uncancelled echo power reduces the noise margin, wherein the noise margin comprises an amount of noise that is added after at least one of a first modem and a second modem achieves steady-state while maintaining a signal to noise ratio above a minimum signal to noise ratio.

34. The system of claim 31, wherein the uncancelled echo power is reduced because of a reduction in one or more effects of a nonlinear echo channel producing noise at frequencies other than a transmitted frequency.

35. The system of claim 31, wherein the uncancelled echo power is reduced because of a reduction in a required number of echo canceller filter taps.

36. The system of claim 24, further comprising:

an increasing power module for increasing transmitted power for a predetermined plurality of frequencies for increasing a signal received at the second modem, the second modem being a remote modem, wherein the received signal at the remote modem is determined by the signal transmitted by the first modem, the first modem being a local modem, and loop attenuation.

37. The system of claim 24, further comprising:

a minimizing module for minimizing a number of transmit filters to be stored by using at least one transmit filter with a plurality of normalized parameters that are normalized to a data rate.

38. The system of claim 37, wherein the normalized parameters comprise a cutoff frequency of the transmit filter.

39. The system of claim 24, wherein a first power spectral density is implemented for optimizing noise performance; and a second power spectral density is implemented for optimizing reach performance.

40. The system of claim 37, further comprising the step of:

an interpolating module for interpolating between the first power spectral density and the second power spectral density.

41. The system of claim 24, wherein the first line condition data and the second line condition data are from a common line.

42. The system of claim 24, wherein the first line condition data and the second line condition data are from different lines.

43. The system of claim 24, wherein one or more of the first line condition data and the second line condition data are derived from cross talk.

44. The system of claim 24, wherein one or more of the first line condition data and the second line condition data comprise a frequency-independent reduction in power determined by calculating a signal to noise ratio using a geometric mean for a sub-band of a total frequency band for a plurality of rates.

45. The system of claim 34, further comprising:

a selecting module for choosing a transmitted power for a predetermined plurality of frequencies to simultaneously balance reducing the uncancelled echo power at the local modem while increasing a received signal at the second modem, the second modem being a remote modem.

46. The system of claim 37, further comprising:

a selecting module for choosing a transmitted power for a predetermined plurality of frequencies to simultaneously balance reducing uncancelled echo power at the first modem, the first modem being a local modem, while increasing a received signal at the second modem, the second modem being a remote modem.